Reviews

Classification and synthesis of nickel pincer complexes*

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Over the past decades, the pincer ligands have attracted an increasing interest due to the unique properties of the coordination compounds they form. These monoanionic tridentate ligands are of great importance in organometallic and coordination chemistry. Their complexes with transition metals are used as homogeneous catalysts for various processes and also as functional materials with specified properties. The metal complexes formed by the pincer ligands provide an efficient alternative to the existing catalysts based on noble metals and, hence, the use of these complexes is a promising task of the modern chemical science. Therefore, nickel as the most accessible and inexpensive analog of palladium and platinum is of great practical interest. In this review, we consider the diversity of nickel complexes with pincer ligands, as well as the existing methods for their preparation and practical application.

Key words: pincer ligands; nickel complexes; catalysts; PCP, NCN, NCP, and SCS ligands.

Introduction

The main task of the modern organometallic chemistry is the development of new catalytic systems and materials with desired practically useful properties. The variation of the ligand nature in transition metal complexes using compounds of different nature, including chelating compounds, results in a significant change in the properties of the metal complexes such as their stability and reactivity. Pincer ligands gain increasing significance among numerous polydentate ligands synthesized over the past decades. They are distinguished by special characteristics and the ability to "tune" electronic properties of the complexes formed. Such a tuning results in the enhancement of the thermal stability of the metal complex systems and, in some cases, in the stabilization of unusual and unstable oxidation states of the metal center in the course of formation of chelate metal cycles.[1—3]

Pincer ligands can be characterized by the general formula E^1YE^2,[4] where E are neutral two-electron donating groups ($—N(R)_2$, $—P(R)_2$, —SR, $—As(R)_2$, or —OR), and Y most frequently represents the 2,6-disubstituted phenyl ring with the anionic carbon atom in position 1.

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